HP StorageWorks

Booting Windows Server 2003 for Itanium-based systems from a storage area network application notes

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i n v e n t

About this document

These application notes describe storage area network (SAN) boot setup procedures on Microsoft® Windows® Server 2003 for Itanium®-based systems for specific software solutions, Fibre Channel host bus adapter (HBA) firmware versions, and Extensible Firmware Interface (EFI) driver versions.

For the latest version of these application notes and other documentation, see the HP storage web site http://h18006.www1.hp.com/storage/saninfrastructure.html.

Application notes information

These application notes contain the following major topics:

Intended audience

This document is intended for customers who are familiar with:

- Enterprise Virtual Arrays (EVAs)
- Modular Smart Arrays (MSAs)
- XP Disk Arrays (XP)
- Windows Server 2003 for Itanium-based systems
- HBAs
- Switch zoning and configuration
- HP Integrity servers

Accessing future product updates

HP strongly recommends that customers sign up online using the Subscriber's Choice web site http://www.hp.com/go/e-updates.

- Subscribing to this service provides you with e-mail updates on the latest product enhancements, newest versions of drivers, and firmware documentation updates, as well as instant access to numerous other product resources.
- After signing up, you can quickly locate your products by selecting **Business support** and then **Storage** under Product Category.

Introduction

Traditionally, HP ProLiant servers boot operating systems from internal SCSI and IDE storage devices. With the support of external booting with StorageWorks Fibre Channel HBAs and RAID arrays, customers can optionally eliminate server-based internal boot devices. Booting from an external device decreases downtime through faster server replacement in the event of a server failure.

Why boot from a SAN?

Booting from the SAN provides:

- Redundant storage paths
- Disaster recovery
- Improved security
- Minimized server maintenance
- Reduced impact on production servers
- Reduced backup time

Additional information

For detailed information about HBAs, switches, storage arrays, and storage software, go to the following HP web sites:

Table 1

Topic	HP web site
HBAs and switches	http://h18006.www1.hp.com/storage/saninfrastructure.html
Storage array systems	http://h18006.www1.hp.com/storage/arraysystems.html
Multipathing software	http://h18006.www1.hp.com/storage/software.html
Integrity servers	http://h18004.www1.hp.com/products/servers/platforms/storage.html

Storage arrays

This document describes single server, cluster, and multipath-based configurations using:

- EVA —multiple bus failover mode or single path
- MSA
- XP

Required hardware and software

Table 2 lists the hardware and minimum software required to boot from a SAN.

Table 2 Required hardware and software

Feature	Requirement
Operating systems	Datacenter and Enterprise Editions of: • Windows Server 2003 for Itanium-based systems • Windows Server 2003 with SP1 for Itanium-based systems
RAID arrays	Enterprise Virtual Arrays Modular Smart Arrays XP Disk Arrays
Fibre Channel switches	B-Series, C-Series, and M-Series switch products. See the *HP StorageWorks SAN design reference guide* on the website http://h18006.www1.hp.com/products/storageworks/san/documentation.html
Servers	All HP Integrity servers are supported. For detailed information, go to http://www.hp.com/products1/integrity/index.html.
HBAs	A7298A, product number A7298A A8002A, product number A8002A A8003A, product number A8003A AB232A, product number AB232A AB379A, product number AB379A AB379B, product number AB379B AB466A, product number AB466A AB467A, product number AB467A AE311A, product number AD300A AD300A, product number AD300A FC2143, product number AD167A FC2243, product number AD168A FC1143, product number AB429A FC1243, product number AB379A FC1142, product number AE311A FC1242, product number AE312A For the latest firmware, driver, BIOS, and EFI versions and information, go to the HP storage web site http://h18006.www1.hp.com/storage/saninfrastructure.html.
Extensible Firmware Interface (EFI)	Minimum requirement: Emulex EFI-Based Setup Utility (ESBU)—3.11a4 Emulex EFI firmware–5.01a8 HP Smart Setup Media 4.00

Restrictions

This section describes:

Operating system restrictions

The following operating system restrictions apply:

- Microsoft Windows operating systems require a unique, dedicated disk for booting. Therefore, each server connected to a RAID array must have its own disk, or LUN (logical unit number), dedicated solely for booting and operating system files. Data can be allocated across both the boot disk and the remaining disks. Booting from array-based disk partitions is possible.

> **NOTE:**
>
> The memory paging system requires fast access to the `pagefile.sys` file. In some cases, in SAN environments with heavy I/O loads, the access request for moving information to or from the paging file may be delayed. This can cause the operating system to halt, requiring a reboot to recover. Microsoft recommends that if paging errors occur, page files should be relocated to disks that are built into the server using its internal data paths. See the following Microsoft article for additional recommendations related to booting from a SAN:http://support.microsoft.com/default.aspx?scid=kb;EN-US;q305547.

- For Windows Server 2003, a crash dump file will not be generated if, at the time of a system crash, the active path to the system drive is different from the active path established when the system was turned on. To ensure that a crash dump is created, restore the path that was the active path at boot time as soon as possible after the failure, and make it the active path. For detailed information, see the Crash Dump File Creation section in http://download.microsoft.com/download/f/9/7/f9775acc-baa6-45cc-9dec-b82983705620/Boot%20from%20SAN%20in%20Windows.doc.
- You must use Windows Server 2003 SP1 in a Continuous Access EVA configuration. Boot Vdisks and application Vdisks must be in separate DR groups. Boot Vdisks for a server or clustered servers must be in a separate DR group.

Clustered server restrictions

This section describes clustered server restrictions for SCSIPORT and Storport miniport drivers.

SCSIPORT miniport driver restrictions

The following SCSIPORT miniport driver restrictions apply:

- Microsoft requires that Microsoft Cluster Servers (MSCS) keep boot disks and shared storage paths on separate data paths. See the article on the Microsoft web site http://support.microsoft.com/default.aspx?scid=kb;en-us;305547.
- These configurations require a minimum of four HBAs.

Storport miniport driver restrictions

The following Storport miniport driver restrictions apply:

- For Storport miniport driver restrictions, see the following Microsoft articles:
  - To properly set up MSCS, see "Cluster is formed by using a local quorum resource after a cluster setup failure in Windows Server 2003," available onhttp://support.microsoft.com/kb/912944/en-us.
  - For boot from SAN and MSCS configurations on Windows Server 2003 systems, see "The updated Storport storage driver, version 5.2.3790.2494, is available for Windows Server 2003," available on http://support.microsoft.com/kb/903081 and "How to add a registry value to a Windows Server 2003-based computer that you start from a SAN so that the startup disk, the pagefile disks, and the cluster disks that are all on the same SAN fabric," available on http://support.microsoft.com/kb/886569/en-us.

- To avoid improper modification of the registry, use the Boot from SAN Cluster Registry Update utility to add the ManageDisksOnSystemBuses key. Download the utility (`BFSCLRegUp.exe`) from http://h18006.www1.hp.com/storage/saninfrastructure.html.
- A minimum of two HBA ports per host is required for any High Availability (HA) configurations.

Standalone server restrictions

In a standalone server environment, an HBA port can share boot and data paths.

Server replacement in the event of a server failure

You must retain the HBAs to ensure that the replacement server hardware components are identical to the ones you are replacing. Place each HBA in the PCI slots of the new server in the same order as they were placed in the old server.

If you are using an internal disk for your paging file system, move this disk to the replacement server. You can also use a new disk, but you must format it and manually reset the paging to that disk.

Prerequisites

The following procedures are not described in detail in this document. However, they must be performed before performing the boot setup procedures.

RAID arrays , page 7

Working with boot disk partitions, page 7

Switch-based zoning, page 7

RAID arrays

Perform the following for EVA, MSA, and XP arrays:

- Verify that all existing storage units (virtual disks) have the proper access settings.
- With switch-based configurations, if zoning is enabled, check the switch to ensure there are no zoning conflicts.

Working with boot disk partitions

Before creating a boot disk, you must start with a clean, unpartitioned virtual disk. Perform the following procedures:

- Create a LUN that is at least 32 GB.
- If you plan to set up booting from a RAID array that has other virtual disks attached to other servers, be aware that when you are setting up booting for the new server, the installation program displays a list of partitions available for loading the operating system. The display contains a disk for every controller port accessible by the HBA. Although it may appear that there is more than one virtual disk available for booting, there is only one virtual disk available.

Switch-based zoning

You must be familiar with switch-based zoning. For information about zoning for your environment, see your switch's installation guide.

Setting up switch zoning

You must set up switch zoning as part of your configuration. See the figures in "Cabling options for single-channel HBAs" on page 8 and "Cabling options for dual-channel HBAs" on page 11.

Setting up initial zoning

1. Create a zone using the world wide name (WWN) or switch port number that includes the boot HBA port and the controller port.

2. Enable the zone.

Finalizing zoning

1. Modify the initial zone to include the second controller port.

2. Create a zone in the second fabric to include the secondary boot HBA port and the two remaining controller ports.
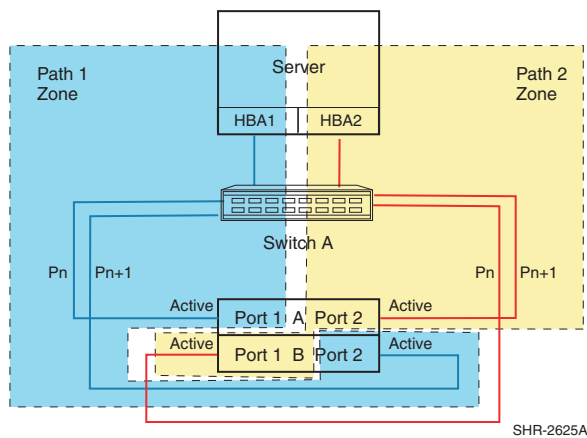
Cabling options for single-channel HBAs

SAN boot is supported in the zoned single-channel HBA configurations, as shown in Figure 1 through Figure 6.
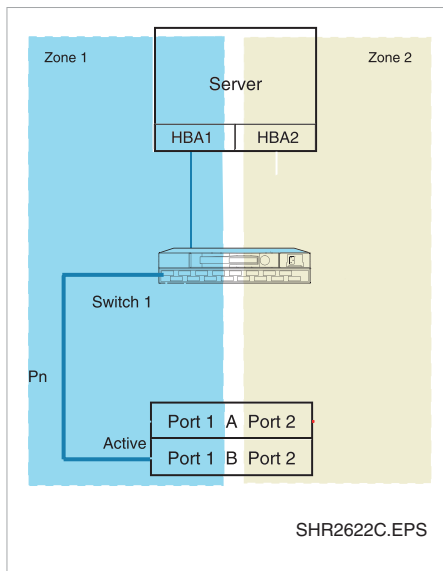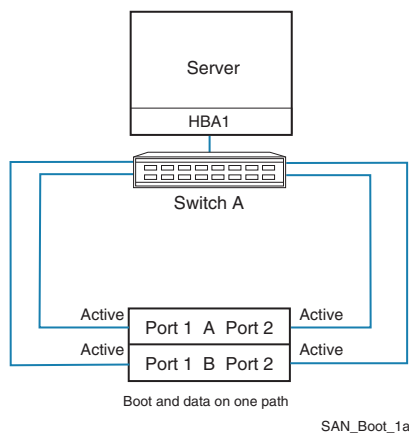

Figure 1 Single server, two single-channel HBAs, one switch, straight-cable storage configuration
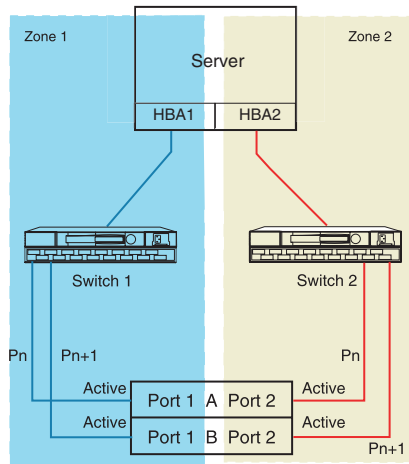
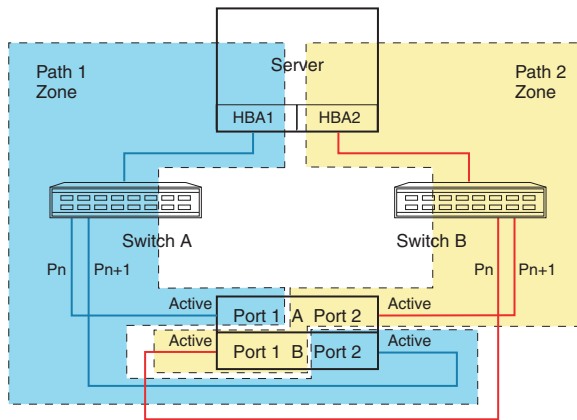**Figure 2 Single server, two single-channel HBAs, one switch, cross-cable storage configuration**

Figure 3 Single server, one HBA, one switch configuration

The configurations shown in Figure 4 and Figure 5 support SCSIPORT or Storport miniport drivers.
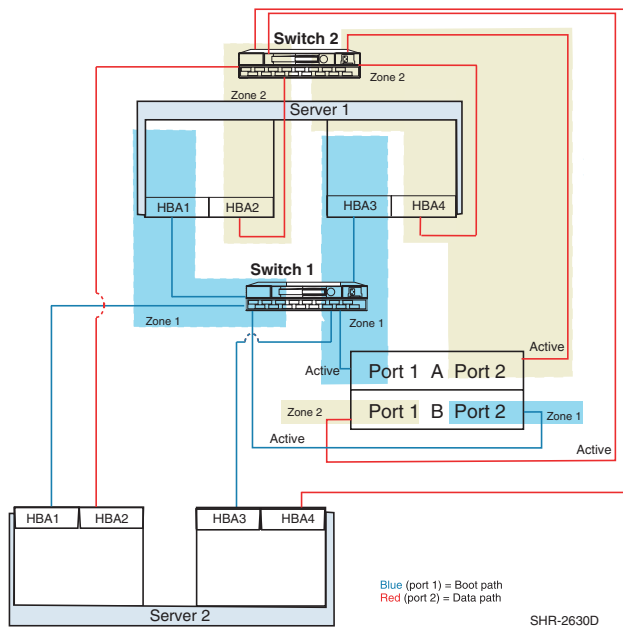
SHR-2631B

Figure 4 Single server, two single-channel HBAs, two switches, straight-cable HA storage configuration

SHR-2427D

Figure 5 Single server, two single-channel HBAs, two switches, straight-cable HA storage configuration

The configuration shown in supports SCSIPORT or Storport miniport drivers.

Figure 6 Clustered servers, four single-channel HBAs per server, two switches, cross-cable HA storage configuration

Cabling options for dual-channel HBAs

Dual-channel HBAs are typically used when the number of server PCI slots is limited. Figure 7 through Figure 12 show the cabling options for dual-channel HBAs.

Figure 7 Single server, one dual-channel HBA, one switch, straight-cable storage configuration

Figure 8 Single server, one dual-channel HBA, one switch, straight-cable storage configuration
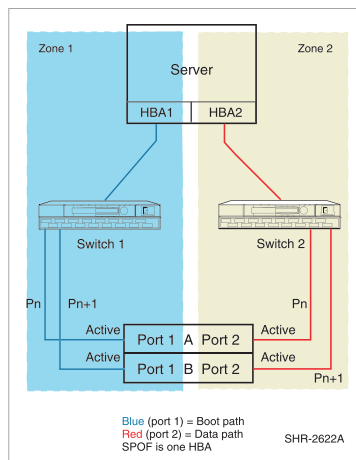
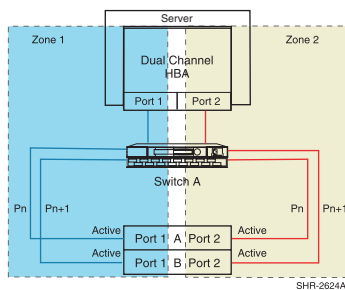**Figure 9 Single server, one dual-channel HBA, two switches, cross-cable storage configuration**

The configuration shown in Figure 10 requires a Storport miniport driver.

Figure 10 Single server, one dual-channel HBA, two switches, straight-cable HA storage configuration

Figure 11 Single server, one dual-channel HBA, two switches, cross-cable HA storage configuration

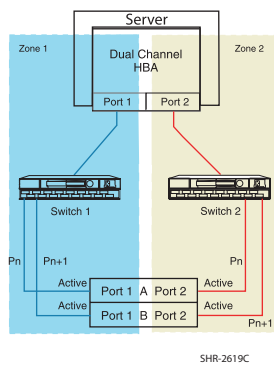The configuration shown in Figure 12 supports Storport miniport drivers.

Figure 12 Single server, one dual-channel HBA, two switches, cross-cable HA storage configuration
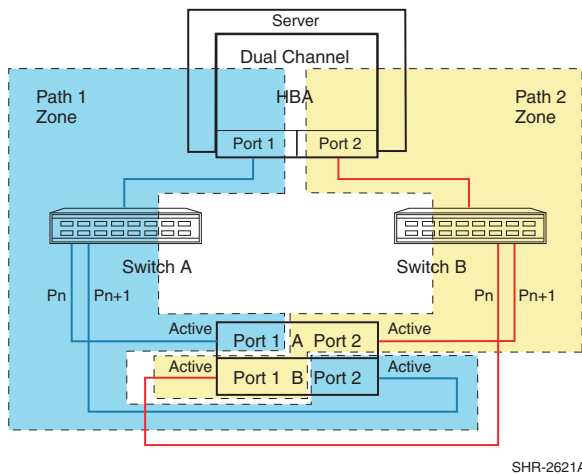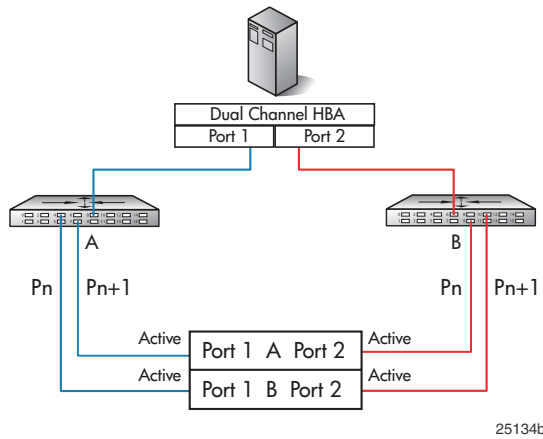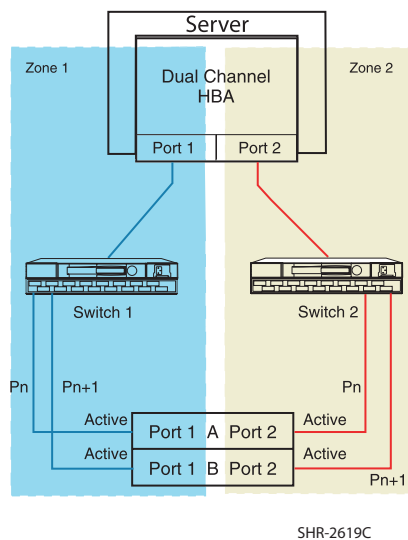
Special considerations

Storport miniport driver support for boot from SAN configurations

HP supports the Storport miniport driver for Windows Server 2003 SP1 for boot from SAN configurations.

For more information about the Storport miniport driver, see the following document: http://www.microsoft.com/windowsserversystem/storage/technologies/storport/storportwp.mspx.

You can obtain supported Storport miniport drivers from the HP SAN Infrastructure web site: http://h18006.www1.hp.com/storage/saninfrastructure.html.

Considerations for booting clusters with SCSIPORT miniport drivers

Windows operating systems require that the HBA used for booting is not the same HBA used for cluster shared storage. You must use separate HBAs or HBA ports in each server when setting up for cluster booting. In general, the key steps for setting up booting include:

- Installing all HBAs but not connecting them
- Configuring each HBA that attaches to boot disks for booting (for clusters, a RAID array needs two separate boot disks)
- Connecting and setting up each HBA for booting, one at a time
- Setting up disk connectivity from each unique boot disk to its server, using the command line interface (CLI) or GUI
- Installing the Windows operating system on a unique and dedicated disk in the RAID array
- Ensuring that the drive letters are the same for the boot disks on both servers
- Booting the servers
- Installing cluster software

> **NOTE:**
> You must run the Smart Component from a command line environment as shown in the following example to ensure that you have the proper driver parameter settings:
>
> ```
> C:\>cp00xxxx.exe /x
> ```

Considerations for multipath environments

Multipathing provides high-availability computing through a redundant data path to the RAID array.

Microsoft requires that the boot HBA be different from the shared-data HBA. When using the SCSIPORT miniport driver in a cluster configuration, each server must have four HBAs (with a minimum of two for boot and two for data, bringing the total to a minimum of eight HBAs for a two-node cluster). This configuration provides data-path redundancy for boot and data. When using the Storport miniport driver, the boot and data paths can reside on the same HBA. Multipath software loads after the operating system has booted and should be treated the same as any other application installation.

For Multipath software version information, go to http://h18006.www1.hp.com/products/sanworks/secure-path/spwin.html

or

http://h18006.www1.hp.com/products/sanworks/softwaredrivers/multipathoptions/windows.html

Special considerations for XP Disk Arrays

Consider the following:

- The boot LUN must be LUN 0.
- If one server is booting from a SAN, one host group is required for the HBA on the server.
- If more than one server is booting from a SAN and all are accessing the same physical port, a unique host group is required for each HBA. Every host group must be assigned on a port with a unique LUN 0. If LUN security is turned off for this port (for example, port CL1-A), all servers defined in the host groups are given access to all LUNs in the default host group.

  For detailed information about XP Disk Array host groups, LUN security, and host modes, see the *HP StorageWorks Command View XP user guide* at:

  http://h20000.www2.hp.com/bizsupport/TechSupport/DocumentIndex.jsp?contentType=SupportManual&locale=en_US&docIndexId=179911&taskId=101&prodTypeId=12169&prodSeriesId=64820.

- To set up the remaining HBA ports, assign nonbooting HBAs to a different host group.

Creating a LUN

The following sections describe how to create LUNs on storage arrays.

Creating a LUN on Enterprise Modular Arrays

To create a LUN on Enterprise Modular Arrays:

1. Using a terminal emulator or a terminal connected to the storage subsystem, enter the following CLI commands to configure a device with no access allowed:

   ```
   HSG> initialize disk10000
   HSG> add unit d1 disk10000 disable_access_path=all
   HSG> show d1
   ```

2. Note the controller to which the LUN is recognized as online.
3. Verify that the HBA is online by entering the following command:

   ```
   HSG> show connections
   ```

4. Optionally, rename the connection.
5. Allow the HBA to access the LUN by entering the following command:

   ```
   HSG> set d1 enable_access_path=!newcon01
   ```

   For more information about LUN Configuration, see the *HP StorageWorks HSG80 installation and configuration guide*.

Creating a LUN on Enterprise Virtual Arrays

To create a LUN on Enterprise Virtual Arrays:

1. Access Command View EVA or the HSV Element Manager through a web browser.
2. Create the LUN and assign a host. You must create a host if one does not exist.
3. Return to the server.

   For detailed information about using the Enterprise Virtual Array Command View, see the *HP StorageWorks Command View EVA getting started guide*.

Creating a LUN on Modular Smart Arrays

To create a LUN on Modular Smart Arrays:

1. Create a virtual disk (LUN) using the Array Configuration Utility (ACU) on a separate server.
2. Using the Selective Storage Presentation option, assign the LUN to the HBA connection.
3. Return to the server.

Creating a LUN on a Disk Array XP

To create a LUN on Disk Array XP:

1. Using a web browser, start Command View XP.
2. Select a port (such as CL1-A).
3. Set LUN security for the array port.
4. Create a host group with the proper host mode (for Windows, host mode = 0x0C).
5. Assign the first boot HBA port WWN to the newly created host group.
6. Assign LUN 0 to that host group.

   For detailed information about using Command View XP, see the *HP StorageWorks Command View XP for XP disk arrays user guide*.

Setting up the server

Before booting from a SAN, set up the server as follows:

- Download and install the latest Integrity system firmware and Smart Setup software.
- Remove the internal hard disks.
- Record the WWN of each HBA port (each HBA should be tagged).
- Install all HBAs and connect one port to be targeted for booting.

Updating the HBA firmware and EFI driver
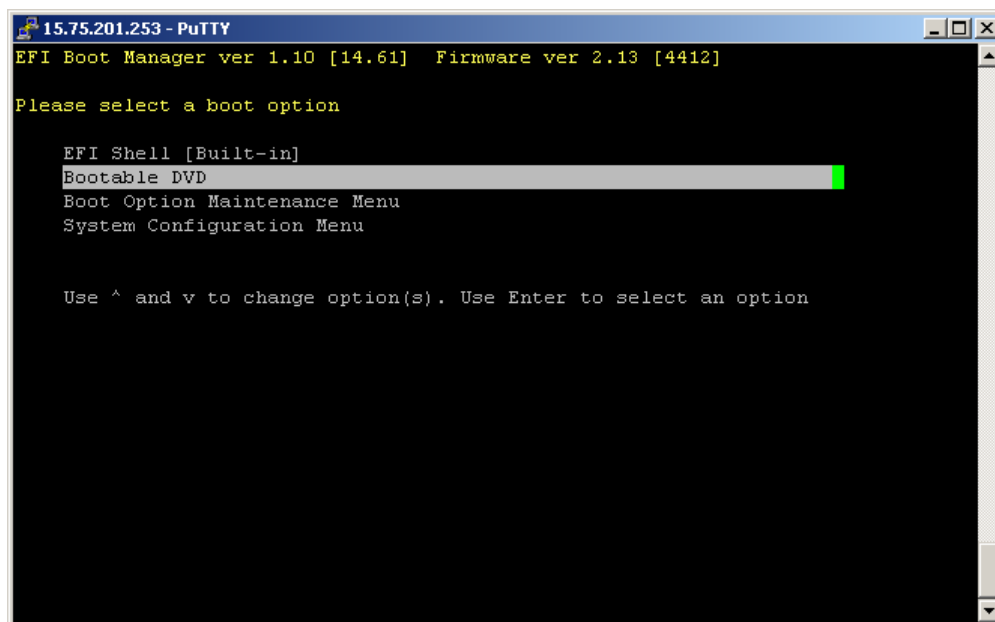
To update the HBA firmware and EFI driver:

1. Insert the Smart Setup media in the CD-ROM drive while the system is booting up.

> **NOTE:**
> Use the Smart Setup media available with your Integrity server, or download the latest Smart Setup software at:http://h71028.www7.hp.com/enterprise/cache/ 277215-0-0-225-121.html.
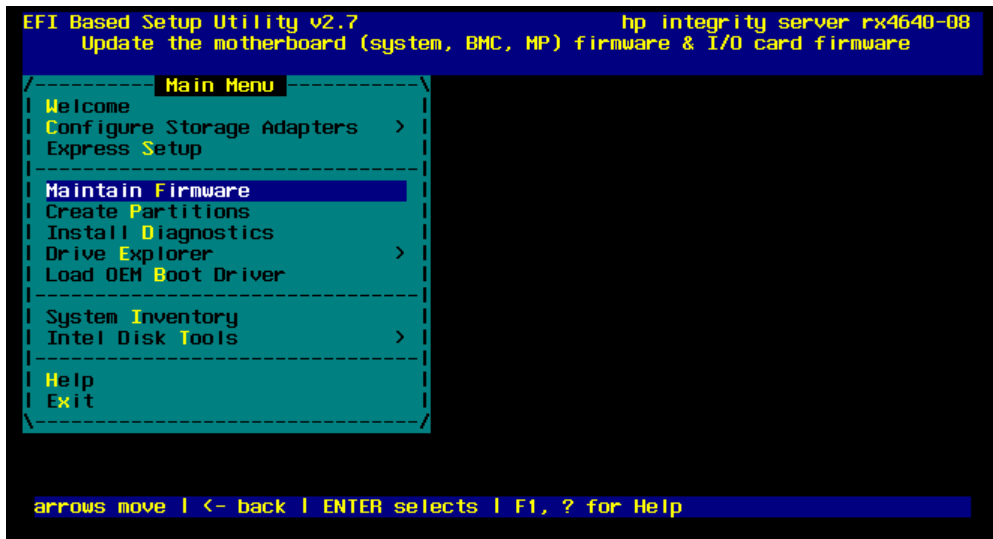
2. Select **Bootable DVD** to display the EFI-Based Setup Utility (EBSU) Boot Manager.

Figure 13 EFI Boot Manager menu

3. Click **OK** to access the main menu.
4. Press **F**, or scroll down and select **Maintain Firmware**.

Figure 14 EFI Boot Manager main menu

5. Verify that the HBA contains the latest firmware and EFI driver.

6. Select the devices you want to update.
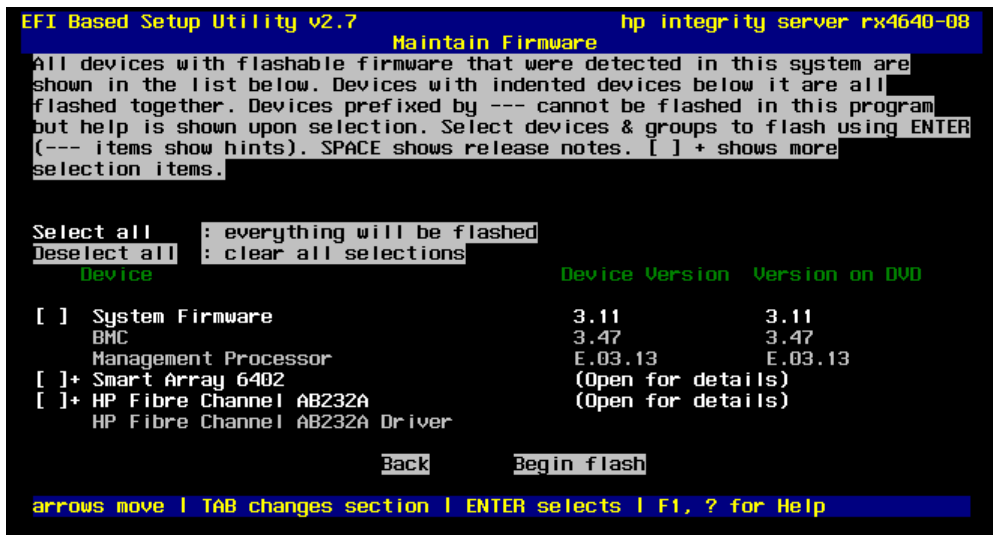
Figure 15 Selecting a device to update

7. Press **Tab** to the **Begin Flash** option to flash the HBA.

8. At the prompt, press **Tab** to the **Continue** option, and then press **Enter** to begin the flash.

When the flash is completed, the utility automatically reboots the server and starts the EBSU. The EBSU indicates that the flash was successful.
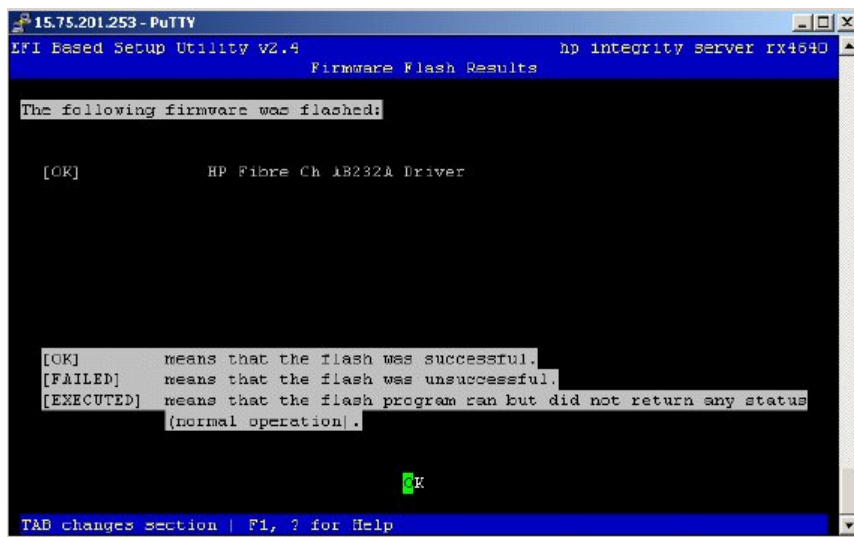
Figure 16 Firmware Flash Results

9. Press **Enter** twice to return to the main menu.

Configuring the HBAs

This section describes how to configure the HBAs.

Configuring the boot device for Emulex HBAs

To configure the boot device for Emulex HBAs:

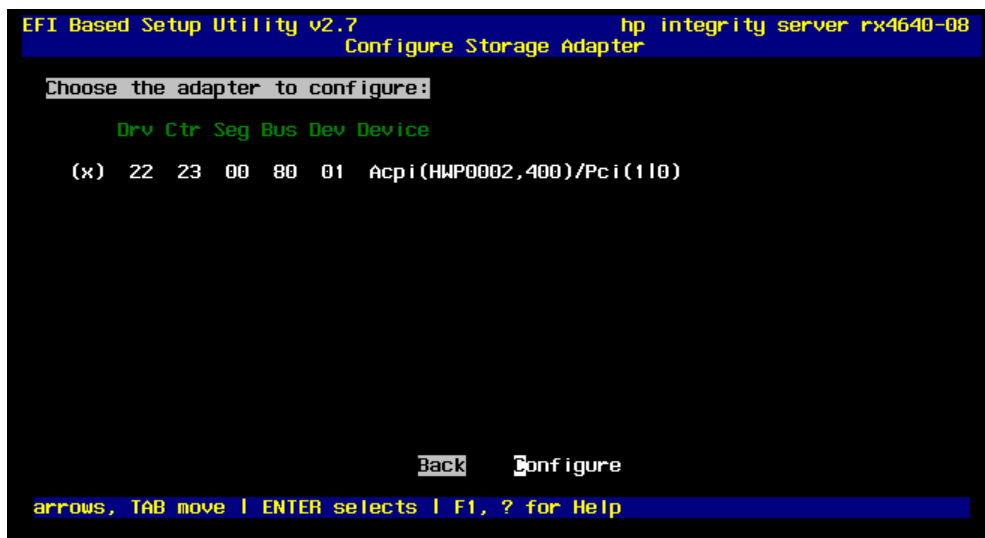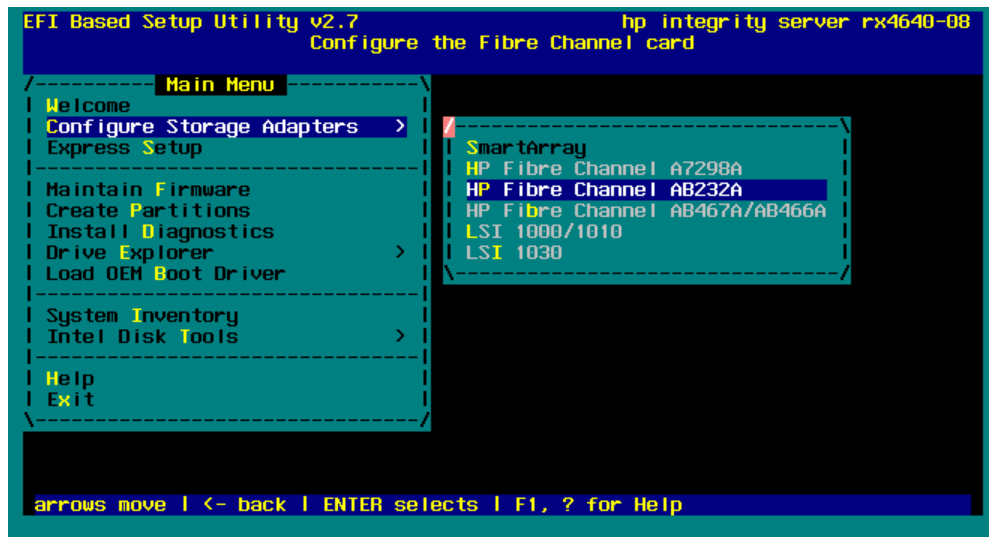**1.** Select **Configure Storage Adapter** and then select an HBA.

Figure 17 Configure Storage Adapter screen

2. Press **Enter** to select and configure the HBA.

Figure 18 Configure the Fibre Channel card screen

3. Select an HBA.

4. Select **Setup Utility**.

5. Select **Reset to Default Values**.

6. Enter **Yes** at the Do you want to force defaults? prompt.

7. Select **Enable or Disable BIOS**.

8. Select **Enabled**.

9. Press **ESC** to return to the main menu.

10. Select **Configure the HBA parameters**.

11. Select **Topology**.

12. Select **Point to Point**.

13. Press **Esc** twice to return to the main menu.

14. Select **Configure Boot Parameters** (The boot table should be empty).

15. Select **Configure Boot Devices**.

> 📝 NOTE:
>
> If there is an entry in the boot table, press **Enter** and then select **Clear Flash Boot Info**. This creates an empty table. Continue with the procedure.

16. Select **Scan Targets** to return to the empty Boot Table screen.

    The HBA is now logged into the switch.

17. Follow the steps in "Setting up initial zoning" on page 8, unless directly connected.

18. On the boot server, select the first line and then press **Enter**.

19. Select **Scan Targets**.

    A single WWN appears. This is the node to which your boot device is attached.

20. Using a storage configuration application, or following the procedures in "Creating a LUN" on page 14, create one LUN and give it access to the HBA WWN.

NOTE:

For Disk Array XP, you must run Scan Targets a second time after you create LUN 0 and present it to the host. Doing so makes the WWNN of the boot HBA available so it can be presented to the LUN.

21. On the boot server, press **Enter** to display a LUN. (This is the LUN to which your boot device has access.) Press **Enter**.

22. Select **Boot this device via WWN**.

The boot table has one entry that displays the boot device target WWN and LUN information.

23. Press **ESC** until you exit the utility.

Configuring QLogic HBAs

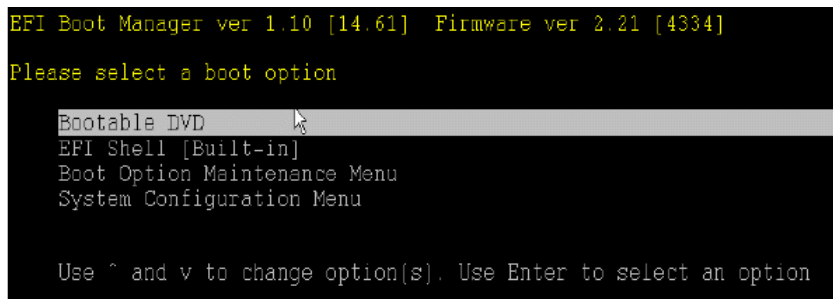QLogic HBAs do not require configuring the boot device.

Installing the operating system

You can install the operating system using one of the following procedures:

Installing from the Re-install CD-ROM

To install the operating system using the Re-install CD-ROM:

1. Insert the Windows operating system Re-install CD-ROM.

2. Select **Bootable DVD** from the EFI Boot Manager menu.


```
EFI Boot Manager ver 1.10 [14.61]  Firmware ver 2.21 [4334]

Please select a boot option

    Bootable DVD
    EFI Shell [Built-in]
    Boot Option Maintenance Menu
    System Configuration Menu


    Use ^ and v to change option(s). Use Enter to select an option
```

Figure 19 Installing the operating system using the Windows CD-ROM

3. When the HP recovery console menu opens, click **Re-install**. Ignore the warning about deleting all data on the drive and click **OK**.

4. When asked to select the boot drive partition size, select **C** to use the full drive size.

5. Use the latest Smart Setup CD-ROM to update the system drivers and agents.

It is not necessary to re-install the HBA driver unless an update is available.

6. Install multipathing software if applicable.

7. Install the latest operating system service pack.

8. Reboot the server to complete the installation.

9. Follow through on for each additional controller port assignment to the HBAs.

10. Connect any nonbooting HBAs.

11. Follow the procedure in "Finalizing zoning " on page 8.

12. Create and assign all other storage LUNs to the appropriate HBAs.

Installing from the Microsoft CD-ROM

Use the following procedures to install the operating system using the Microsoft CD-ROM.

Loading the HBA driver

To load the HBA driver:

1. Insert the HP Smart Setup CD-ROM.

2. Select **Bootable DVD** from the EBSU menu and press **Enter**.

3. Select **Load OEM Boot driver** or press **B** to display the Load OEM Boot Driver screen.
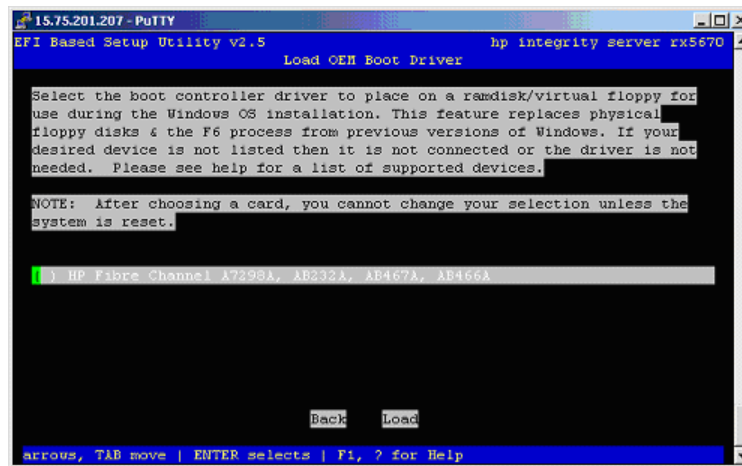
Figure 20 Load OEM Boot Driver

4. Select the appropriate Fibre Channel HBA and press **Enter**.

5. Press **Tab** once and then press **Enter** to load the driver.

   The system displays a message confirming that the driver is loaded.

6. Select **Exit** or press **X** to exit.

Preparing the SAN disk device for operating system installation

To prepare the disk device for operating system installation:

1. Select **EFI Shell** on the EBSU menu.

2. With the HP Smart Setup CD-ROM in the DVD drive, change to the CD-ROM file system.

> **NOTE:**
> The CD-ROM file system might be mounted somewhere other than fs0.

3. At the command prompt, change to the location of the Diskpart Utility:

```
Shell> fs1:
fs1:\> cd efi\efi_utils
```

4. Run the DiskPart Utility:

```
fs1:\efi\efi_utils> diskpart.efi
```

5. List the partitions available:

```
DiskPart> list
```

Output similar to the following appears:

```
### BlkSize BlkCount
--- ------- ----------------
0 200 B40
1 200 4800000
```

> **NOTE:**
> Device 0 is the virtual floppy disk and Device 1 is the LUN created to install the operating system. The BlkCount value varies depending on the size of the LUN created; it does not match the LUN size.

6. Enter the select command to select the boot device:

```
DiskPart> Select 1
Selected Disk = 1s
```

7. Inspect the disk. If a message other than the following displays, use the clean command to destroy all partitions on the disk.

```
DiskPart>inspect
Selected Disk = 1
The disk is RAW, nothing to inspect.
```

8. Exit DiskPart:

```
DiskPart> exit
```

9. Remove the HP Smart Setup CD-ROM and insert the Windows Server 2003 CD-ROM in the drive.

10. Rescan the drives, which gives the CD-ROM system access to the Windows CD-ROM files.

```
fs1:\efi\efi_utils > map -r
```

11. Select **Exit** to return to the EFI Boot Manager menu.

You are now ready to install the operating system.

Installing the operating system

> **NOTE:**
> For RX8620 or RX7620 systems, follow the instructions in "Special procedures for RX8620 or RX7620 systems" on page 23 before installing the operating system.

To install the Windows Server 2003 operating system:

1. With the Windows Server 2003 CD-ROM in the DVD drive, select **Bootable DVD**. Press any key to boot the CD-ROM and start the installation process.

> **NOTE:**
> Do *not* press **F6** to load any mass-storage device drivers.

2. Use the latest HP Smart Setup CD-ROM to update the system drivers and agents.

3. To re-install the HBA driver, run the Smart Component by selecting **Drivers > Driver for FC HBA**.

   This sets the HP-supported registry parameters. When you reboot, these changes are implemented (step 5).

4. Install multipathing software.

5. Reboot the server to complete the installation.

> **NOTE:**
> For single-path configurations, skip steps 6 through 8.

6. Follow steps 6 through 22 in "Configuring the HBAs" on page 18 for each additional controller port assignment to the HBAs.

7. Connect any nonbooting HBAs.

8. Follow the procedure in "Finalizing zoning " on page 8.

9. Create and assign all other storage LUNs to the appropriate HBAs.

Setting up the other server nodes

Before installing the operating system on other nodes in the cluster, repeat the setup steps described in Setting up the server, Updating the HBA firmware and EFI driver, and Installing the operating system for the other servers.

Special procedures for RX8620 or RX7620 systems

Use the following installation procedures for RX8620 or RX7620 systems before installing the Windows operating system.

Running Express Setup

1. With the HP Smart Setup CD-ROM in the DVD drive, select **Bootable DVD**.

2. Select **Express Setup** and follow the on-screen instructions.

3. After Windows formats the drive and reboots, continue with the procedure for adding the NOVESA settings to the boot LUN.

Adding the NOVESA settings

1. Select the EFI shell and change the directory to the boot LUN (fs1:).

NOTE:

The boot disk might be mounted in a location other than fs1.

2. Change the directory to MSUTIL, and then enter the `NVRBOOT` command. The following example shows the results:

```
Shell:\>fs1:

fs1:\> dir Directory of:  fs1:\ 07/17/03 11:48a 127 fail_file.txt
03/25/03 05:00a 841,216 SETUPLDR.EFI 06/25/03 11:14a <DIR> 1,024 EFI
06/25/03 11:14a <DIR> 1,024 MSUtil 2 File(s) 841,343 bytes 2 Dir(s)

fs1:\> cd msutil fs1:\MSUtil> nvrboot NVRBOOT: OS Boot Options
Maintenance Tool [Version 5.2.3683] * 1.  Windows Server 2003,
Enterprise 2.  EFI Shell [Built-in] * = Windows OS boot option
(D)isplay (M)odify (C)opy E(x)port (I)mport (E)rase (P)ush (H)elp
(Q)uit
```

3. Select **(M)odify** to modify the OS boot loader.

4. Enter the boot option to you want to modify:

```
Enter OS boot option to modify:  1
```

5. Enter **2** to modify the operating system load options.

6. Enter the `OsLoadOptions` command with the `/NOVESA` option:

```
OsLoadOptions = /redirect /NOVESA
```

7. Exit the operating system load options and go to step 3 in "Installing the operating system" on page 20.